Draft Environmental Assessment of the Proposed Chase-recapture Experiment under the International Dolphin Conservation Program Act

prepared by
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Introduction

In the late 1950s, fishermen in the eastern Tropical Pacific (ETP) became aware of the close association between schools of dolphins and large yellowfin tuna (over 25 kilograms), and used the knowledge of this association catch tuna by setting their nets around the more easily located dolphin schools. In the 1960s, purse seining replaced pole fishing as the predominant fishing gear in this fishery. Fishermen continued to locate tuna by searching for dolphins and setting their nets around schools of dolphins to capture the tuna swimming below. Studies began in 1971 to estimate the incidental dolphin mortality caused by U.S. and foreign yellowfin tuna purse seine vessels in the ETP. At that time, the ETP fishery was dominated by U.S. vessels and the level of annual dolphin mortality was estimated to be over 350,000 dolphins. With enactment of the MMPA in 1972, incidental mortality from fishing by the U.S. domestic fleet began to decline, but participation in the fishery by foreign vessels began to increase. Although the U.S. industry was instrumental in developing gear for reducing mortality and adopting procedures for releasing animals, foreign vessels were not subject to the requirements of the MMPA, and dolphin mortality associated with fishing by the foreign fleet began to rise as their participation grew in the ETP.

To address concerns regarding increased dolphin mortality by foreign vessels, Congress made several amendments to the MMPA in the 1980s and early 1990s. The 1984 amendments tightened the importation requirements for fish and fish products harvested by foreign tuna vessels in the ETP, while the 1988 amendments, imposed additional requirements on domestic and foreign tuna fishermen. Then in 1990, the Dolphin Protection Consumer Information Act (DPCIA) was passed. The DPCIA required that tuna labeled as "dolphin-safe" meet certain dolphin-safe criteria: Tuna harvested in the ETP by purse seine vessels greater than 400 short tons carrying capacity on a trip where no dolphins were encircled at any time on the entire trip could be labeled as being dolphin-safe. Although the DPCIA did not prohibit tuna that did not meet the dolphin-safe labeling requirements from being imported, U.S. tuna canners instituted a voluntary campaign purchasing only dolphin-safe tuna for processing.

In 1992, the International Dolphin Conservation Act (IDCA) was passed to establish an international moratorium on the practice of harvesting tuna through the use of purse seine nets deployed on or to encircle dolphins or other marine mammals, and it established limits on dolphin mortality by U.S. fishing vessels and required that the number of dolphins killed or

seriously injured decrease from one year to the next. Under the IDCA, estimated U.S. dolphin mortality decreased from 19,712 in 1988, to 1,004 in 1991, to less than 500 in 1992, and to 115 animals in 1993.

However, foreign participation in the ETP fishery continued to increase, and this source of mortality was monitored under a voluntary international dolphin conservation program organized by the Inter-American Tropical Tuna Commission (IATTC). This prompted nations with tuna fishing interests in the ETP, including the United States, to adopt a non-binding multilateral program known as the La Jolla Agreement. The La Jolla Agreement established a dolphin mortality reduction schedule providing for progressive reductions in annual dolphin mortalities, with a goal of eliminating dolphin mortality in the fishery. The IATTC adopted this agreement and by 1993, nations fishing in the ETP under the La Jolla Agreement reduced dolphin mortality to less than 5,000 dolphins annually, six years ahead of the reduction schedule established in that agreement. In 1995, the governments of eleven nations participating in the fishery signed the Panama Declaration to establish conservative species/stock-specific annual dolphin mortality limits and represented an important step toward reducing bycatch in ETP tuna fisheries and implementing sound ecosystem management.

The International Dolphin Conservation Program Act (IDCPA), a 1997 amendment to the DPCIA and the MMPA, was created to implement the Declaration of Panama by allowing, under certain specific circumstances, the importation of currently embargoed yellowfin tuna into the United States. The law also includes provisions that could allow tuna caught by the intentional encirclement of dolphins with a purse-seine net in the ETP to be labeled as "dolphin-safe" if no dolphins were observed to be killed or seriously injured in that set. With this, and the IDCPA provision that allows non-dolphin-safe tuna to be imported into the United States for the first time in over five years, Congress acknowledged the substantial efforts of the international tuna purse seine fleet to reduce dolphin mortality. The provision changing the dolphin-safe labeling standard would go into affect unless the Secretary of Commerce determined that depleted dolphin stocks are being significantly adversely affected by fishing operations.

The number of dolphins killed by the ETP tuna purse seine fishery had been dramatically reduced to less than 5,000 dolphin since 1993 and to less than 2000 since 1998 (NMFS 2000), a level considered non-threatening to dolphin stocks. While recent activities within the ETP tuna purse-seine fishery have reduced observed mortality of dolphins to very low levels, there is concern that the act of repeated chase and encirclement during fishing operations has caused and may be continuing to cause physiological stress to the dolphins involved and that such stress may be having a significant adverse impact on population recovery through reduction of reproduction and/or survival. Studies of the frequency of encirclement of individual dolphins in the ETP tuna purse seine fishery (Perkins and Edwards, 1999) estimate that each dolphin from any of the three target stocks may be chased and captured an average of eight times per year, with some individuals captured as frequently as once per week.

The Secretary made an initial finding on April 29, 1999, that there was insufficient evidence to conclude that the fishery was having a significant adverse impact on any depleted dolphin stock and is required to make a final finding by December 31, 2002. To determine if depleted

dolphins are subject to significant adverse impact by the fishery, the IDCPA requires that research consisting of population abundance surveys and "stress studies" be conducted by the NMFS, The proposed chase-recapture experiment would serve as one component of a suite of research efforts that is being conducting pursuant to the mandates of the IDCPA.

1.0 Purpose of and Need for Action

The Marine Mammal Protection Act of 1972 (MMPA), as amended, and its regulations placed a moratorium on "taking"[1] marine mammals except under permit or other authorization. The National Marine Fisheries Service (NMFS) may issue permits for the taking and importing of marine mammals for scientific research or to enhance the survival or recovery of a species or stock. Permits for these activities are generally categorically excluded from the requirement to prepare an Environmental Impact Statement (EIS) or an Environmental Assessment (EA) under the National Environmental Policy Act (NEPA) because these activities are generally not considered to have the potential for significant environmental effects (see NOAA's Administrative Order 216.6, May 20, 1999). However, NEPA regulations require that evaluation of the activity must consider the intensity of impacts, taking several factors into consideration, including the degree to which the impacts are likely to be highly controversial (Sec. 1508.27(b)(4)). Consequently, due to the unusual nature of this research proposal, NMFS has chosen to prepare this EA.

The scope of this EA addresses the different aspects of conducting the experiment explicitly mandated in MMPA Sec. 304(a)(3)(C). Other elements pertaining to the implementation of the IDCPA are not within the scope of this EA and are not included herein. While the NMFS published an EA on the implementing regulations for the IDCPA in 2000, it did not address the scientific research tenets of the IDCPA, and there are no EISs or EAs related to scientific research under the IDCPA or that influence the scope of this EA.

The NMFS Office of Protected Resources, has received an application from NMFS, Southwest Fisheries Science Center (SWFSC) for a scientific research permit (SRP) to conduct an "experiment involving the repeated chasing and capturing of dolphins by means of intentional encirclement", mandated in the 1997 IDCPA as one component of stress studies on dolphins involved in the eastern tropical Pacific tuna purse seine fishery. The requested research will cover a two-month period during August-October 2001, in the ETP between the coast of Mexico and 120°W longitude and between 5°N and 25°N latitude using a NOAA research vessel and a chartered tuna purse seine vessel that has recently and actively been engaged in setting on dolphins.

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[1] As defined in the MMPA, "take" means to "harass, hunt, capture, kill, or attempt to harass, hunt, capture, or kill" any marine mammal. The MMPA further defines two levels of "harassment" as (Level A)"any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal stock in the wild;" or (Level B) "any act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to migration, breathing, nursing, breeding, feeding, or sheltering but does not have the potential to injure a marine mammal or marine mammal stock in the wild."

The objective of the studies, as outlined in the IDCPA, is to "evaluate whether the intentional deployment on, or encirclement of, dolphins by purse-seine nets is having a significant adverse impact on any depleted dolphin stock." The proposed experiment will include several complementary research projects that address different ways in which chase and capture stress may manifest itself in individual dolphins involved in tuna purse seine operations. Research techniques for evaluating stress will include: a) analyses of single and repeat blood samples; b) molecular analyses of stress from skin samples; c) measurement of dolphin surface and body temperatures to investigate heat stress; d) satellite tagging and tracking; and e) documentation of reproductive status and, if it occurs, cow/calf separation between successive chases. During the course of the project, dolphins will be chased and encircled by the tuna purse seine vessel using standard fishing methodology. Within each set, individual dolphins will be tagged (with radio, satellite, thermal sensor or roto tags) and sampled (blood, biopsy, temperature, ultrasound, EKG). Care will be given to monitor the well-being of all animals handled, and to minimize risks to the dolphins. All dolphins will be released using the backdown procedure. On subsequent days, the animals with radio tags will be tracked and re-captured for sampling. The results of the combined studies will provide broad data on the potential for fishery-caused stress.

This EA is a companion document to the scientific research permit (SRP) application which is incorporated herein by reference. It is appended to the SRP application and distributed simultaneously for review. A higher level of detail concerning the research protocol and estimated takes is contained in the SRP application, and the reader is invited to review that document for such specifics.

Planning to fulfill the research mandates under the IDCPA began in 1997. In developing the IDCPA scientific research program, the NMFS consulted with the MMC and IATTC, and invited and allowed for the participation by and correspondence with non-governmental organizations and Congressional staff on research plan development and specific studies within the research program. In addition, academic experts were extensively involved in evaluation of all aspects of the scientific research program. Results of NMFS research pursuant to the IDCPA have undergone and will continue to be subjected to an external peer-review process, including a review by the Center for Independent Experts (at the University of Miami). The NMFS has also held the following consultations specifically pertaining to the Chase-recapture experiment:

9-11 July 1997: Research planning meeting for investigation of the potential influence of fishery-induced stress on dolphins in the ETP, including the chase-recapture experiment. Participants included nine academic experts, the IATTC, and NMFS scientists (see Curry and Edwards 1998).

9 September 1999: Consultation between the NMFS and non-governmental organizations (NGOs) regarding the chase-recapture experiment. Seven NGOs with a known interest in this issue were invited to participate. Six representatives of three of the NGOs attended. The other invited NGOs that did not attend were encouraged to submit written comments to the NMFS on the experiment (see Sisson and Edwards 2000).

25-26 April 2000: Chase-recapture experiment consultation. Seven academic experts, IATTC and MMC representatives participated (see Donahue et al. 2000).

30-31 January 2001: Blood parameter workshop. A panel of experts in dolphin physiology and blood analyses was convened to determine the most effective suite of blood parameters to measure for the assessment of stress in ETP dolphins during the chase-recapture experiment (Curry and Forney, in prep). The blood analyses form the "backbone"of the chase-recapture experiment. The blood samples collected during the proposed chase-recapture experiment would provide repeated measures of stress indicators over a time course that includes multiple sets for single animals over a period of days or weeks. The objective is to measure the time course of responses of stress-related blood parameters in individual animals and to evaluate the potential for recovery between sets. The blood samples would also provide indications of potential muscle damage, and sex and relatedness of dolphins.

1.1 Proposed Action

Details of the proposed action, including location and research protocol are contained in the SRP application and are summarized here. The following is an overview of the proposed action for a general understanding of the objectives and techniques.

The applicant requested authorization to take a total of up to 24,000 individual dolphins from several species by one or more of the following: chase, helicopter overflight, encirclement; and up to 540 dolphins are proposed to be sampled, examined, tagged, and released. Most or all of the encircled dolphins will be spinner dolphin *(Stenella longirostris)* or pantropical spotted dolphin *(Stenella attenuata)* but other species that may be caught incidentally and sampled include short-beaked common dolphin (*Delphinus delphis)*, long-beaked common dolphin (*Delphinus capensis)*, striped dolphin *(Stenella coeruleoalba*), Fraser's dolphin *(Lagenodelphis hosei*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), bottlenose dolphin *(Tursiops truncatus*), rough-toothed dolphin *(Steno bredanensis*), Risso's dolphin *(Grampus griseus*), pilot whale *(Globicephala* spp.), and melon-headed whale *(Peponocephala electra*). The take (i.e., capture) estimates are based on a maximum of 60 sets during the entire two-month project, with up to nine dolphins handled per set, and an average school size of about 400 dolphins. The estimate of average dolphin school size is derived from IATTC observer program data for 1998-99 (1998: 392 dolphins per set; 1999: 465 dolphins per set). It is likely, however, that fewer dolphins will be captured during the proposed research, because a similarly designed capture/recapture study in 1992-93 encircled an average of only 100 dolphins/set during 29 sets made (S. Chivers, NMFS unpublished data). Based on realistic expectations of field constraints, the total number of handled individuals will probably less than the maximum requested 540 dolphins, most likely yielding about 180-300 dolphins sampled.

The applicant also proposes to incidentally harass an unspecified number of animals of all of the above listed species as a result of activities requested of the survey/chase-encirclement/capture and release activities. No direct lethal takes are requested, but unintentional mortality is possible and therefore, the applicant requests an unintentional mortality of 40 animals over the duration of the research project.

After arrival in the study area, schools of spinner dolphins and/or pantropical spotted dolphins will be located visually (using 25x binoculars) from the flying bridge of the research vessel or the crow's nest of the chartered tuna fishing vessel. When weather conditions are acceptable (Beaufort sea states 0-3, daylight), the tuna vessel will begin operations following standard fishing methods of chasing and encircling dolphins (National Research Council 1992). If a helicopter is available on board the tuna vessel, it will aid in locating the targeted or tagged dolphins within a school (at altitudes of 500-1000 ft over the dolphins to be captured). After capturing at least a part of the school, the net will be drawn closed at the bottom ('pursed') and retrieved as it is during normal fishing operations. Behavioral data, including standardized scans of dolphin behavioral states and focal animal sampling, will be collected from the crow's nest of the tuna vessel. Thermal photographs of dolphins will be taken from a small boat inside the net circle while the net is being retrieved, for about 20-40 minutes. The outboard engine on the small boat will be kept at slow idle and care will be taken to stay at a safe distance from the dolphins. This small boat will be removed from the net area before the net diameter becomes too small for safe operation around the dolphins, gear, and researchers.

When it is determined safe, rafts and personnel will be deployed into the net for dolphin sampling and tagging. One to three deployed rafts will each contain one veterinarian or biologist skilled at collecting blood samples and attaching tags, and at least one assistant. An equal number of rafts will be deployed and partially flooded to hold the dolphins during sampling. At least three swimmers will be in the net to capture individual dolphins and assist in getting them into the sampling rafts. Handling time will be kept as brief as possible, and is estimated to take about 7-12 minutes per dolphin based on similar research conducted in 1992-93. The set coordinator will monitor operations from a separate raft, with particular attention to net stability and the state of dolphins.

All handled and sampled dolphins will be marked for future identification using either instrument packages, roto tags, or roto-radio tags. Instrument packages (including radio transmitters, time-depth recorders, thermal data-loggers, or satellite transmitters) will be attached to 1-3 animals per set, and roto-tags or roto-radio tags will be attached to any additional handled animals. Blood samples will be obtained from all tagged dolphins using standard sampling methods (see below), and skin samples will be collected (via skin plug from tagging, biopsy, and/or skin swab). As time permits, a thermal probe will be used on a subset (up to 40) of the handled animals to measure core body temperature. An ultrasound will be performed on female dolphins to determine pregnancy status. A non-invasive EKG will be performed using a portable unit as time permits, to identify potential heart muscle damage.

The ability to select individual dolphins for handling in the net based on age, sex or reproductive state is limited, and it is expected that animals of all sex, age (excluding calves, but not excluding mothers) and reproductive classes may be tagged. Whenever possible, a high priority will be placed on tagging and recapturing adult females, because stress-related effects on reproduction (miscarriage, damage to foetus, separation from calves) are one major way that individual stress could translate into population-level effects. Any calves associated with a particular handled female will be allowed to remain as close as possible to the mother during tagging. Additionally, a skin sample will be obtained from the calf (using a scrubber, brillo pad

or other minimally non-invasive skin sampling method designed to collect only the upper layers of skin), to allow DNA verification of relatedness between the calf and the presumed mother. This procedure will allow documentation of whether cows and calves are separated during the chase and encirclement operations that occur during purse-seine fishing. Little data are available on this important source of potential fishery-caused mortality of dolphins (Archer et al., 2001). Fishing-related encirclement of individual ETP dolphins has been estimated to occur as often as once per week (Perkins and Edwards, 1999). The study covered in this permit application is not expected to increase the number of cow/calf separations that may occur during purse-seine fishing operations, because in the absence of this study, the fishing vessel would have been engaged in normal dolphin-set fishing operations, causing similar separation events. The study will merely allow the detection of these events, if they happen. Without tagging females and genetically verifying relatedness of presumed mother/calf pairs, this important source of mortality cannot be documented properly.

All sampling operations will be terminated when necessary (see SRP application) to ensure safety of personnel and dolphins and proper functioning of the backdown procedure. As the backdown procedure is initiated, biopsy samples will be collected from animals as they leave the backdown channel using a biopsy pole. These biopsy samples will provide additional molecular skin samples from animals known to have been encircled, for comparison to the historical samples analyzed at the SWFSC. Furthermore, the biopsy samples from animals that were not handled in the raft will provide a means of evaluating stress caused by handling compared to stress from only chase and encirclement, and to identify any repeat captures of additional dolphins that were not previously tagged.

Sample Collection: A combination of data collection techniques including (a) blood sampling, (b) skin sampling via biopsy and skin swab, (c) tagging, (d) deep body and surface temperature measurements, (e) other sampling for studying effects of repeated chase and recapture will be employed in the research. (For details of sampling/tagging protocols see accompanying SRP application). The following is a synopsis of the equipment and protocols:

(a) Blood components to be investigated include standard veterinary hematology and chemistry panels that will be indicative of overall animal health, exertion-related enzymes, stress hormones, and immunological indicators. Combined, these blood analyses will provide a synoptic evaluation of the animals' health, and will allow the documentation of any cumulative effects of chase-recapture stress, if it occurs during the course of repeated dolphin-set operations. Changes in these blood parameters will be interpreted relative to the first sample for each animal, the time interval between samples, previously published values for these and other species of small odontocetes, established changes in stress and disease, and comparative samples from bottlenose dolphins recaptured previously during other ongoing studies.

(b) Skin samples will be collected for genetic and stress analyses. Two types of analyses will be performed: (1) genetic analyses to determine relatedness of individuals and potential repeat captures of unmarked dolphins, and (2) molecular analyses of stress responses in the skin samples, following methodology recently developed at the SWFSC specifically to investigate stress in ETP dolphins (Southern and Dizon 1999). The stress signatures of sampled animals,

which have a known capture history during the course of this study, will be compared to a large number of historic samples obtained during fishery operations, from bowriding animals in areas of varying fishing intensity, and from captive stressed and non-stressed animals.

(c) Tagging/instrument packages to be deployed will be attached to the dolphins using methods that have been safely and successfully used on bottlenose dolphins and on pantropical spotted dolphins in the ETP (MMPA Permit No. 799). The deployments will range in duration from days to weeks and should not cause any long-term adverse impacts on the dolphin stocks involved.

Tag Attachment methods: Tags and instrument packages will be combined in Saddle packages (i.e., a saddle to which tags and instruments are attached) that will be secured to the dolphin's dorsal fin with ¼-inch delrin pins and magnesium corrosible nuts. These packages will collect data for the duration of the studies. Suction-cup attachments will be used to mount these instrument packages when only a few hours of data are required. These packages will be pressed onto the dorsal surface of the dolphin or on the dorsal fin; gentle pressure on the sides of the saddle attaches the suction cups. Roto tags (Scott et al. 1990) will be attached through the trailing edge of the dorsal fin using specially designed pliers. These roto-tags remain attached for weeks to months and have been used for decades as a dolphin identification method (Scott et al.,1990). In this experiment, roto tags will provide information about group cohesion within the captured dolphin school and will allow identification of previously captured and sampled dolphins; roto-radio tags represent a modification of the simple roto-tag design to allow inclusion of a small (<20g) radio transmitter with a battery life of about 30 days. These tags are mounted via a single threaded delrin pin and corrodible nut for time release after several weeks. This type of tag represents the least invasive means of identifying and relocating sampled dolphins over short distances and time periods.

Instrument packages: The saddle packages and suction cup packages will each contain a combination of one or more of the instruments described below. Total package weight will be less than 500g for packages including thermal data-loggers, or less than 300g for all other packages. Maximum dimensions of the packages will be less than 28 x10 x 9 cm. The primary instrument to be used during this experiment will be a VHF radio tag to allow tracking and to repeatedly sample selected individual dolphins. Each radio tag deployed will be paired with a time-depth-velocity recorder (TDR), and a satellite tag or a thermal data-logger to collect additional data about the dolphin's behavior and thermal condition.

- Radio tags will allow individual dolphins to be tracked from the research vessel and subsequently re-captured by the purse seine vessel. The 148 MHz radios tags are 7.6 cm x 1.3 cm with a 40 cm transmitting antenna, weigh approximately 30 g and are capable of withstanding water pressure at 500m depth. These are essentially the same tags that were successfully used during the 1992 and 1993 study of ETP spotted dolphins under MMPA permit No. 799.

- Time-depth-velocity-recorders are data loggers (Mk 8, Wildlife Computers) that record the time, depth, and velocity of the animal at specified time intervals as the animal moves

through its environment. The tags are 7.4 cm long x 5.7 cm wide x 3 cm high and weigh approximately 70 g. They were successful deployed and recovered on ETP spotted dolphins during the 1992 and 1993 experiment.

- Satellite tags will collect data on dolphin movement by recording geographic position and on dive behavior by recording time-at-depth information. The tags weigh about 170g and are designed to transmit for weeks to months.

- Thermal data-loggers are designed to collect data on dolphin temperature and heat flux. The tag consists of several components including a Vatell Episensor disc and a data logger (Mk7, Wildlife Computers) that will record time, depth, water temperature, skin surface temperature, and heat flux continuously on free-ranging dolphins. The 2.5 x 2.5 cm heat flux disc is mounted on a small spring, to ensure constant contact between the disc and the fin while the animal swims. Temperature is also recorded using a thermistor. The electronics are potted in epoxy and fitted into lateral pockets of the attachment package mounted on the dolphin's dorsal fin. Total dimensions are less than 28 x 10 x 9 cm, and total weight, including the saddle package and radio transmitter is less than 500g. These thermal tags have been previously developed and tested on bottlenose dolphins in Florida (Pabst et al.1999), and are designed to release after approximately 48 hours.

(d) Deep body and surface temperature measurements provide an important window into the physiological status of an animal. Like other mammals, dolphins can regulate their body temperature by controlling the flow of blood to the body surface (e.g. Scholander and Schevill 1955). The dolphins' uninsulated dorsal fin and flukes function as thermal windows across which excess body heat is dumped to the environment, and cooled blood is returned to the body core. Dolphins possess a reproductive countercurrent heat exchanger (CCHE) that cools the uterus and, hence, the developing fetus in females (Rommel et al. 1993, Rommel et al. 1998) and the cryptic testes in males (Rommel et al. 1992). In this study, the hypothesis that chase and capture causes dolphins to suffer thermal stress will be tested. Three complementary data sets will be collected: (1) infrared thermographic images; (2) deep core body temperatures; and (3) thermal data loggers to record temperature (see above). These measurements will allow comparison of the ETP dolphin temperatures to those collected from (a) captive animals before and after high exercise activity and (b) wild dolphins after a short chase and capture in other permitted research activities. Recent captive animal work suggests that there is a latency period between the finish of exercise and the highest heat flux rates. Therefore, the most extreme thermal effects may occur after the animal has been released from the set. The thermal data-loggers offer an opportunity to capture that effect and to assess the health and thermal status of the animal upon its subsequent recapture.

Deep body temperatures will be measured using a standard veterinary probe, or a linear array of five copper-constantan thermocouples (Omega Teflon-coated 30 gauge wire) aligned on a flexible plastic tube, inserted into the rectum. The outside diameter of the probe is 5mm, and the length of the probe is 0.40 m. Insertion distance will be adjusted according to dolphin size, e.g., about 15-20 cm for *Stenella* dolphins. The array is covered with thin-walled heat shrink tubing,

which makes the probe weatherproof and electrically non-conductive. The probe is calibrated in a copper tube to ensure uniform thermal conditions. Measuring deep body temperatures with the array of thermocouples within the probe offers a safe means of assessing the effects of changes in peripheral blood flow on dolphin deep body temperatures. Experiments conducted on captive dolphins at the Naval Oceans Systems Center. Hawaii Laboratory have been reviewed and accepted by the NOSC Animal Use Center. In these experiments, no perceivable differences in animals reactions to the use of this probe versus any of the standard veterinary probes used to monitor a single core temperature were observed (Sweeney and Ridgway 1975).

Surface temperatures will be measured from thermal images obtained using a DTIS 500 infrared camera (Emerge Vision Systems) on dolphins swimming in the net, during handling, and after release. Captured digital images will be analyzed using Equine software (Emerge Vision System). The use of the DTIS 500 infrared camera is completely non-invasive.

(e) Other samples will only be obtained if the animal is not visibly adversely reacting to the handling. The additional sampling may involve a rapid (30-60 second), non-invasive ultrasound scan that will be performed using a Sonograder model (Renco) portable ultrasound unit to investigate pregnancy status in handled females. This unit can be used to rapidly establish pregnancy, but does not provide information on fetus stage or length. The A-mode ultrasound detects fluid-filled organs (i.e. an embryo in utero, distinguishable from the bladder), and has been evaluated by the project veterinarian for reliability in captive dolphins. The results will be used in conjunction with blood progesterone levels to ascertain pregnancy in the field. A portable electrocardiogram (EKG) unit (Biolog model made by Micromedical) will be used to monitor heart function and damage to heart muscle if time permits.

2.0 Alternatives (including the proposed action)

The IDCPA explicitly mandates conducting an "experiment involving the repeated chasing and capturing of dolphins by means of intentional encirclement." Thus alternative actions that can effectively meet this requirement are limited. However, NMFS has considered three alternatives with regard to issuing the proposed SRP. The first is the no action alternative in which a permit would not be issued; the second is issue the SRP for the proposed action; and the third is to issue the SRP to conduct the research using an alternative study design. The environmental analysis of each alternative is considered in the Environmental Consequences section.

2.1 Alternative A - No Action/Deny Permit Request

NMFS may deny the permit request if it is inconsistent with the purposes and policies of the MMPA and if potential adverse impacts on the marine environment outweigh the potential benefits of the research. By not issuing the permit, NMFS would not fulfill its mandate under 16 U.S.C. §1414(a)(3)(C) to execute the "chase-recapture" experiment and would be in violation of the MMPA and DPCIA by not ultimately including the results of this research component in the information provided to the Secretary of Commerce for making a final determination in 2002. Further, fishing operations will remain status quo.

2.2 Alternative B - Issue Permit for Proposed Action

The proposed action alternative is to issue a permit to authorize the chase-recapture experiment according to the experimental design developed by NMFS in consultation with the MMC, the IATTC, non-governmental organizations, and federal and non-federal scientific experts. The two-month project would involve a research team of 15 experienced researchers. The research entails execution of a series of sampling protocols at sea on free-ranging dolphins to determine the effects of repeated chase/encirclement events on dolphin stocks. The goal of the chase/recapture experiment is to provide sound scientific data on physiological indicators of stress in chased and captured dolphins, and, if possible, to estimate a range of consequences for the individual dolphin's survival and reproduction. The design of the chase/recapture experiment consists of a suite of complementary research projects that separately address different ways in which chase/recapture stress may manifest itself. The individual research techniques, when combined, will provide data on the potential for fishery-caused stress in dolphins repeatedly chased and encircled using tuna purse seine methods. Additionally, some of the physiological data may allow estimation of quantitative or qualitative effects on survival and reproduction of individuals, which can be included in a population dynamics model to estimate a range of potential population-level effects.

It is critical that the proposed chase-recapture experiment be conducted during the time of the year when the NMFS is able to take advantage of limited seasonal weather conditions that would allow for the highest level of opportunities for conducting the research in the most safe, effective manner possible. It is also critical that the NMFS conduct this research with enough time to allow complete data analysis, and consideration of that analysis for the final finding in 2002.

See section 1.1 Proposed Action and the SRP application for details of study design and numbers of animals involved in the research project.

2.3 Alternative C - Issue Permit using an Alternative Test Method

An alternative test method was submitted to NMFS by an individual (also proposed on the Animal Welfare Institute web site: http://www.awionline.org/wales/w-sum98.htm#del]. This alternative involves research on dolphins that are chased and encircled with purse seine nets, but would make opportunistic use of purse seine vessels engaged in regular fishing operations, rather than a chartered, dedicated tuna vessel and a research support vessel. In this alternative, three teams of two to four biologists and technicians, would be trained and placed on commercial purse seine vessels that fish on dolphins in the ETP. After each trip (lasting about two months), the research teams would be transferred to a new vessel to continue research and sample collection. The fishing vessels would engage in their regular fishing practices, and all activities would be filmed for later study. After encircling dolphins and tuna during standard fishing operations, the research team would enter the net and collect blood samples from dolphins exhibiting signs of stress or adverse effects from chase and encirclement including rafting, sinking, or 'sleeping' behaviors, for later hormonal and chemical analyses.

3.0 Affected Environment

3.1 Physical Environment

For the purposes of this experiment, the ETP refers to an area of the Pacific Ocean that covers approximately 19 million square miles and is bounded by 40°N latitude, 40°S latitude, 160°W longitude and the coastlines of North, Central, and South America (50 CFR 216.3). The ETP serves as habitat for many marine species, including yellowfin, skipjack and bigeye tunas, and a variety of dolphins, and it appears to be the only area in the world where tuna and dolphins are frequently found in close association with one another. The tuna-dolphin association primarily occurs in a subregion of the ETP, a triangular region roughly the size of the continental U.S. (about 10 million km^2), extending from the tip of Baja California (about 20°N) southward to Peru (about 20°S) and seaward to about 140°W. The requested research will take place in the ETP between the coast of Mexico and 120°W longitude and between 5°N and 25°N latitude (Figure 1).

3.2 Biological Environment

In contrast to other areas of the equatorial Pacific Ocean, where the thermocline is generally 150-200 meters (m) deep, the depth of the thermocline layer throughout much of the ETP extends only 50-100 m below the surface. Water temperatures in this upper mixed layer are quite warm (25-30°C), and oxygen concentrations are high. Thus, total biological productivity in the ETP is high compared to other tropical oceans. Ocean currents and winds generate a typical pelagic (offshore) environment, where areas of high productivity are distributed in dynamic, complex, non-random patterns or patches. In general, the productivity of the ETP is higher near the coastlines and decreases with distance offshore, but a number of ocean currents, which tend to control local levels of biological activity, can strongly affect the productivity of various areas. Large climatic events such as El Niño can temporarily change the distributions and abundance of various marine species, with patterns returning to more normal conditions when the anomalous event has passed. The ETP is host to a wide variety of vertebrate and invertebrate species in addition to tunas and dolphins, including zooplankton, bill fishes, sharks, whales, and sea turtles.

3.2.1 Marine Mammals

Tunas in the ETP are most frequently associated with the offshore stocks of spotted dolphins, which have historically been set on by tuna purse seiners. However, the frequent appearance of spinner dolphins (eastern and whitebelly stocks) in sets makes this species also quite significant, although in almost all sets they appear in mixed herds with spotted dolphins. The common dolphin is another species which has been targeted for sets by purse seiners, although sets on this species have been less frequent in recent years than on the previous two species. Other species are sometimes found in association with tunas, but much less frequently. These include the

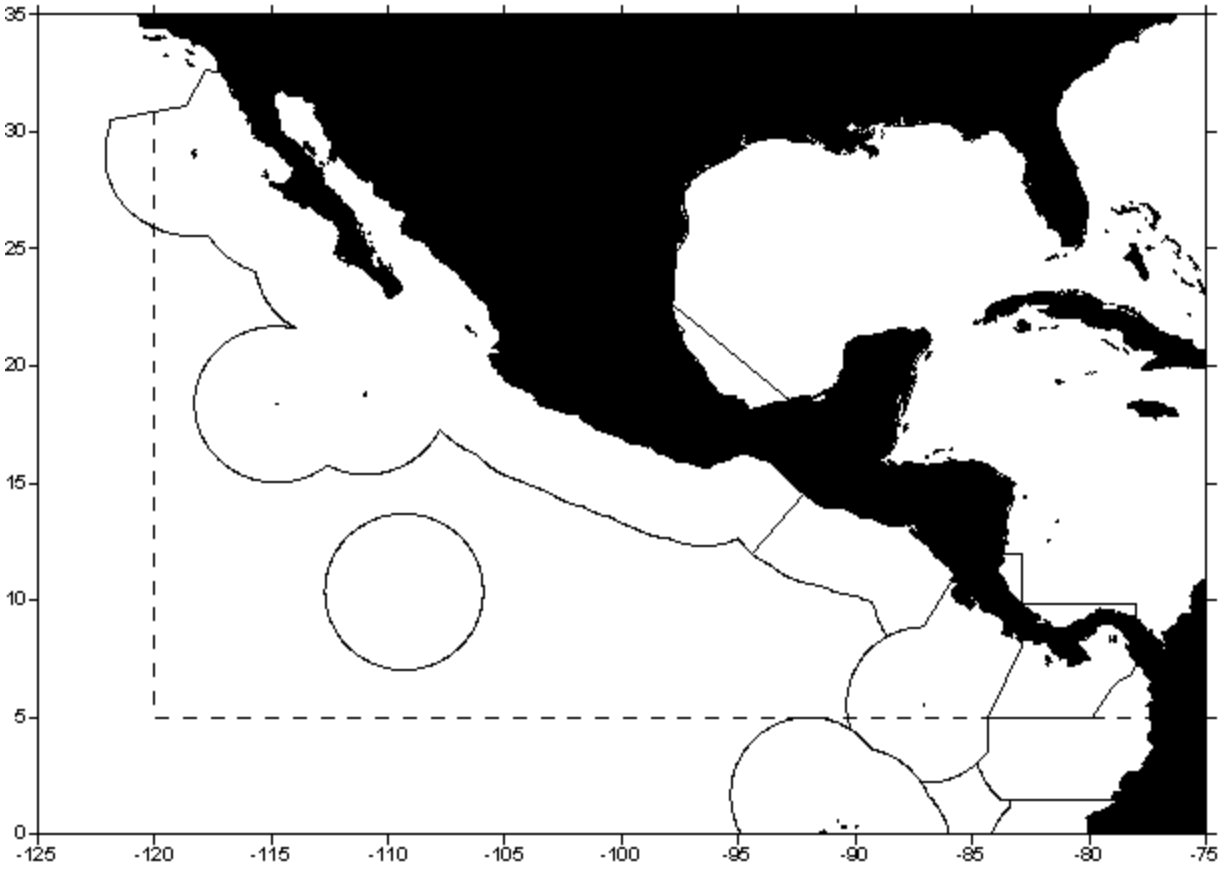

Figure 1. Eastern Tropical Pacific study area. Dashed line is the stock area for eastern spinner dolphins and northeastern offshore spotted dolphins. Thin solid lines are approximate Exclusive Economic Zones. Provided in the following summary can be found in Wade and Gerrodette (1993), NMFS (1991), and IATTC annual reports.

striped dolphin, the rough-toothed dolphin, the bottlenose dolphin, and Fraser's dolphin (NRC, 1992).

The following is a brief presentation of information on the status of each marine mammal stock that may be incidentally taken during the conduct of this research. Most of the information provided in the following summary can be found in Wade and Gerrodette (1993), and IATTC annual reports.

The experiment would primarily involve the following target species and stocks of marine mammals:

Spinner dolphin, *Stenella longirostris orientalis*, Eastern Stock
Spinner dolphin, *Stenella longirostris*, 'Whitebelly' Stock
Pantropical Spotted dolphin, *Stenella attenuata*, Northeastern Offshore Stock
Pantropical Spotted dolphin, *Stenella attenuata graffmani*, Coastal Stock

Pantropical Spotted Dolphin (*Stenella attenuata*) - There are three recognized stocks of spotted dolphins in the ETP: northeastern offshore, western/southern offshore, and coastal. Spotted dolphins range from 1.6 to 2.6 m long and weigh up to 100 kg, depending on the stock involved (Dizon *et al*., 1994). Animals in the northeastern and western/southern offshore stocks are relatively smaller, have smaller teeth, and are, on average, less spotted than the coastal stock. Distinctions between the northeastern and the western/southern offshore stocks have been made based on external morphology and skull measurements. Spotted dolphins are extremely gregarious, and the offshore stocks are often found in aggregations of more than several hundred animals, frequently in mixed herds with spinner dolphins. The coastal stock is usually encountered in herds of less than 100 animals (NMFS, 1991).

The northeastern offshore stock is distributed from just above the equator at 5°N and west to 120°W (Wade, 1993). On average they are larger than the western/southern form and smaller than the coastal form (NMFS, 1991). It is generally thought that this population, under conditions of no incidental mortality, should be increasing at approximately 2-6 percent per year. Using research vessel data for 1986-90, the northeastern offshore spotted dolphin population abundance has been estimated at 738,100 (range 588,700-970,400 animals (CV = 0.14)) (Wade and Gerrodette, 1993). The total fishing mortality for this stock for both the U.S. and the foreign fleets combined averaged approximately 48,000 northeastern offshore spotted dolphins between 1986 and 1990. The fishing mortality rate (dividing annual estimates of mortality by conservative annual estimates of population abundance) varied between 2.4 percent and 4.5 percent over the five years, although there is evidence that these rates may be overestimations because of sampling bias (NMFS, 1991). Mortality decreased in the late 1990s, with the average annual mortality from 1995-97 down to 864 animals (IATTC Report, 1998). In 1993, NMFS determined that the stock was below its maximum net productivity level and designated it as a depleted stock under the MMPA (58 FR 58285, November 1, 1993). From these surveys in the ETP, the 1998 and 1999 abundance has been estimated at 1,011,104 (CV=0.26) and 592,423 (CV=0.24), respectively (Gerrodette, 1999 and Gerrodette, 2000). The point estimates of 1999 abundance for northeastern offshore spotted dolphins are lower than, but not significantly

different from, the 1998 estimates. The stock has no special status under the Endangered Species Act (ESA).

On average, animals in the western/southern offshore stock of spotted dolphin tends to be shorter in length than the northeastern stock (NMFS, 1991). Using research data from 1986-90, the population of the southern offshore stock has been estimated at 1,298,400, ranging between 918,700 and 1,654,100 animals (CV = 0.15) (Wade and Gerrodette, 1993). The average annual fishing mortality was estimated at 3,200 animals from that same time period. The fishing mortality rate varied between 0.3 percent and 1.9 percent, although as with the northeastern stock, these estimates are most likely positively biased (NMFS, 1991). The average mortality of this particular stock from 1995-97 was 739 animals (IATTC Report, 1998). The 1998 and 1999 abundance estimates for the western/southern offshore spotted dolphin are 743,166 (CV=0.30) and 710,793 (CV=0.45), respectively (Gerrodette, 1999 and Gerrodette, 2000). The point estimates of 1999 abundance for western/southern offshore spotted dolphins are lower than, but not significantly different from, the 1998 estimates.

The coastal spotted dolphin ranges from the Gulf of California to approximately 28°N latitude and is normally found in waters within 50 km of the coast. The stock occurs continuously along the Mexican, Central American, and South American coasts to well south of the equator. Animals of this stock are larger and more robust than the other stocks and there light-colored spotting is so extensive that they are sometimes referred to as a "silver-back" (NMFS, 1991). Abundance estimates indicate a population of 29,800 animals, ranging from 15,100 to 50,800 animals (CV = 0.35), based on 1986-90 surveys (Wade and Gerrodette, 1993). Estimates of fishery-caused mortality are considered unreliable because of the difficulty in separating the offshore and coastal forms and because of the low level of fishing effort in nearshore waters (NMFS, 1991), although a 1997 survey estimated an annual mortality of 26 animals (IATTC, October 1998 Report). The 1998 and 1999 abundance estimates for the coastal spotted dolphin are 108,289 (CV=0.41) and 73,866 (CV=0.57), respectively (Gerrodette, 1999 and Gerrodette, 2000). The point estimates of 1999 abundance for coastal spotted dolphins are lower than, but not significantly different from, the 1998 estimates. The coastal spotted dolphin has been listed as depleted since 1980 (45 FR 72178 (October 31, 1980)). NMFS has decided to factor the coastal spotted dolphin into its initial and final findings on the effects of chase and encirclement. Coastal spotted dolphins have no special status under the ESA.

Spinner dolphin (*Stenella longirostris*) - There are four recognized stocks of spinner dolphins in the ETP: northern whitebelly, southern whitebelly, eastern, and Central American. Due to the high degree of overlap in distribution between the northern and southern whitebelly spinner dolphin stocks, it has been suggested that northern and southern whitebelly stocks be combined into a single management unit. Spinner dolphins often occur in very large herds and are often found mixed with spotted dolphins. The stocks most affected by the tuna purse seine fishery are the whitebelly and eastern stocks (NMFS, 1991).

Spinner dolphins reach a length of 1.5-2.2 m, although the size varies among the stocks. The Central American spinner is the longest, reaching a length of 2 m or more, while the eastern spinner dolphin is the smallest. The spinner dolphin name is derived from its habit of leaping

clear of the water and spinning on its longitudinal axis, rotating as much as seven times in one leap (NMFS, 1991).

Eastern spinner dolphins are, on average, about 3-4 cm smaller than the whitebelly spinner dolphins (NMFS, 1991). The abundance estimate for this species, based on the five ship surveys from 1986-90, is 631,800, ranging from 389,500 to 938,300 (CV = 0.24) (Wade and Gerrodette, 1993). Although U.S. fishermen are not allowed to set on pure schools of eastern spinner dolphins, incidental mortality by foreign vessels occurs. The total fishing mortality of eastern spinner dolphins from 1986-90 ranged from 5,400 to 19,500 per year, averaging approximately 13,860 animals per year. The estimated level of mortality varied between 0.9 percent and 3.3 percent for 1986-90 (NMFS, 1991). The average annual mortality of the eastern spinner dolphin between 1995-97 was 502 animals (IATTC Report, 1998). Because the eastern spinner has fallen below its optimum sustainable population level, in 1993 it was designated as a depleted species under the MMPA (50 CFR 216.15; 58 FR 45066, August 26, 1993). The 1998 and 1999 ETP abundance estimates for the eastern spinner dolphins are 1,157,746 (CV=0.34) and 338,961 (CV=0.39), respectively (Gerrodette, 1999 and Gerrodette, 2000). The point estimate of 1999 abundance for eastern spinner dolphins is significantly lower than the 1998 estimate. Since identical methods were used, the reason for this difference is not clear, and both should be considered equally valid estimates of abundance. The 95% confidence limits are large for all estimates, which reflects the difficulty of sampling mobile animals in an extremely large area. CVs of estimates are generally higher in 1999 due to less effort (two ships in 1999 instead of three in 1998). It has no special status under the ESA.

The abundance estimate for the southern whitebelly spinner stock based on the 1986-90 ship surveys is 1,019,300 animals, ranging from 694,400 to 1,456,200 animals (CV = 0.19) (Wade and Gerrodette, 1993). Incidental mortality for the whitebelly stock has been lower than for the eastern stock, varying between 3,500 and 11,000 per year from 1986-90. The average mortality during this time was 7,160 animals per year. Percent fishing mortality ranged from 0.4 percent to 1.1 percent (NMFS, 1991). The average annual mortality of the whitebelly spinner dolphin from 1995-97 was 456 animals (IATTC Report, 1998). This stock has no special status under the MMPA or the ESA.

The following other dolphin species would not be targeted in the proposed research, but may be caught incidentally and/or sampled during the proposed research: Although not specifically sought after, samples from these "non-target" species would be considered relevant to the overall experiment because some level of mortality for these species has occurred in the ETP tuna purse seine fishery.

Striped dolphin (*Stenella coeruleoalba*) - The striped dolphin is a small species with distinctive black lateral stripes from the eye to flipper and the eye to anus and a white V-shaped blaze from above and behind the eye to below the dorsal fin. This is a gregarious species and can be found in groups of several hundred to several thousand (Leatherwood and Reeves 1983). It is widely distributed in the ETP. Though earlier work suggested that there were two geographical stocks (northern and southern) of striped dolphins, recent investigations by Dizon *et al*. (1994) indicate that striped dolphins in the ETP should be managed as a single stock. Based on the 1986-90 ship

surveys in the ETP, this stock is estimated at 1,918,000, ranging between 1,531,800 and 2,249,300 animals (CV = 0.11) (Wade and Gerrodette, 1993). Eighty striped dolphins were reported killed in the 1997 tuna purse seine fishery (IATTC report, 1998). This stock has no special status under the MMPA or the ESA.

Short-beaked (*Delphinus delphis)* and long-beaked common dolphin (*Delphinus capensis*) - Both varieties of this species are slender and streamlined with a well-defined beak and distinctive V-shaped "saddle" color pattern. They are among the most gregarious of all dolphin species, often found in schools of hundreds to more than one thousand (Leatherwood and Reeves 1983). This species is widely distributed along the California coast out to at least 300 nmi distance from shore (Forney et al. 2000) and southward into Mexican waters to about 13° N (Perrin et al. 1985; Wade and Gerrodette 1993; Mangels and Gerrodette 1994). The California/Oregon/Washington stock, for the purposes of management activities in U.S. waters, may be an extension of the "northern common dolphin" stock defined for management of ETP tuna fisheries (Perrin et al., 1984). However, short-beaked common dolphins involved in the tuna purse seine fisheries in international waters of the ETP are managed under the authority of the Inter-American Tropical Tuna Commission. Between 1994 and 1998, annual mortality of northern common dolphins (which may include both the short- and long-beaked varieties) ranged from 9-261 animals, averaging 91 per year (IATTC, 2000).

Pacific white-sided dolphin (*Lagenodelphis obliquidens*) - The Pacific white-sided dolphin has a short, thick beak has a slightly more robust body than other dolphins. Its dorsal fin is its most distinctive trait, as it is hooked with black on the leading edge and pale gray toward the rear. This species of dolphin is also quite gregarious, forming schools of one thousand or more (Leatherwood and Reeves 1983). This species is found in U.S. territorial waters and Mexican waters. Pacific white-sided dolphins are rarely involved in tuna purse seine fishing operations, and this mortality is managed under the authority of the Inter-American Tropical Tuna Commission.

Rough-toothed dolphin (*Steno bredanensis*) - This species' habits are poorly known, though it has been found in association with schools of yellowfin tuna in the ETP and has been seen with pilot whales and bottlenose dolphins, and less frequently with spotted and spinner dolphins. It has a cone-shaped body, a long slender beak, and a sloping forehead. The body is often covered with yellowish-white blotches and the lips and tip of the snout are white. Its name stems from the fact that its teeth are not smoothly conical, as in typical dolphins; instead, the crown is usually marked by a series of fine vertical wrinkles (Leatherwood and Reeves, 1983). Rough-toothed dolphin abundance in the ETP, based on 1986-90 ship surveys, was estimated at 145,900, ranging between 89,400 and 256,800 (CV = 0.32) (Wade and Gerrodette, 1993). Twenty rough-toothed dolphin were reported killed in the ETP purse seine fishery in 1997 (IATTC Report, 1998). This species has no special status under the MMPA or the ESA.

Bottlenose dolphin (*Tursiops truncatus*) - Bottlenose dolphins usually form groups of 10 or 25 individuals, although herds of several hundred have been reported from some offshore regions. They are widely distributed in the ETP and commonly mix with spotted and spinner dolphins (Scott and Chivers, 1990). They have a robust head and body with a short beak. Their color

pattern varies from brown to charcoal, with lighter sides and belly, and a nondescript cape (Leatherwood and Reeves, 1983). The 1986-90 ship surveys estimated the bottlenose dolphin species in the ETP at 243,500, ranging between 190,900 and 409,900 animals (CV = 0.29) (Wade and Gerrodette, 1993). The estimated incidental annual mortality from the tuna purse seine fishery ranges from zero to almost 200 (reviewed *in* Scott and Chivers, 1990). Ten bottlenose dolphins were reported killed in the ETP purse seine fishery in 1997 (IATTC Report, 1998). This species has no special status under the MMPA or the ESA.

Fraser's dolphin (*Lagenodelphis hosei*) - Fraser's dolphins have robust bodies, short beaks, and rather small dorsal fins. They are blueish gray on the back and white on the belly, with a longitudinal striping pattern on the sides. Occasionally, these dolphins will be found in mixed herds of spotted dolphins and have been observed in the company of false killer whales, sperm whales, striped dolphins, and spinner dolphins. In the ETP, they are most often found in equatorial waters (Leatherwood and Reeves, 1983). The estimate of the Fraser's dolphin population in the ETP, based on the 1986-90 ship surveys, was 289,300, ranging between 138,000 and 508,100 animals (CV = .34) (Wade and Gerrodette, 1993). No Fraser's dolphins were reported killed in the ETP purse seine fishery in 1997, although some mortality of this species occurred between 1987 and 1997 (IATTC Report, 1998). This species has no special status under the MMPA or the ESA.

Risso's dolphin (*Grampus griseus*) - Risso's dolphins are occasionally seen as solitary individuals and pairs, but are usually more gregarious, occurring in herds of 25 to several hundred. They have been found in close company with pilot whales. The adults are white or light gray, with dark dorsal fins, flippers, and flukes, a tall, falcate dorsal fin, and extensive scarring. They have a short beak and bulbous forehead. The NMFS 1985-90 ship surveys estimated ETP Risso's dolphin populations to be 175,800, ranging from 90,000 to 375,400 animals (CV = 0.38) (Wade and Gerrodette, 1993). No mortality of Risso's dolphins was reported in 1997, although some mortality was reported during 1986 and 1997 (IATTC Report, 1998). This species has no special status under the MMPA or the ESA.

Long-finned/short-finned pilot whale (*Globicephala* spp.) - During the NMFS 1986-90 ship surveys, the majority of the *Globicephala* spp. observed were "probably" *G. macrorhynchus*, or the short-finned pilot whale. An unknown quantity of sightings of *G. melaena*, the long-finned pilot whale, were "probably" encountered at the southern extreme of the study area in the Peru current, but field identification was not possible (Wade and Gerrodette, 1993). Both look similar, although the short-finned species has shorter flippers and fewer teeth, with a more tropical distribution. Pilot whales have a bulbous forehead and a short beak. They are gregarious, sometimes forming aggregations of several hundred to more than a thousand, and are often found with other smaller odontocetes, primarily bottlenose dolphins. On average, however, they are typically seen in small groups of less than fifty animals. Short-finned pilot whales are killed incidentally in the ETP purse seine fishery (Leatherwood and Reeves, 1983). The estimate of long- and short-finned pilot whales in the ETP, based on ship surveys from 1986-90 was 160,200 animals, ranging from 112,300 to 198,400 (CV = 0.14) (Wade and Gerrodette, 1993). Five pilot whales were killed in the ETP purse seine fishery in 1997 (IATTC Report,1998). These species have no special status under the MMPA or the ESA.

Melon-headed whale (*Peponocephala electra*) - The melon-headed whale is a tropical species and forms large herds of 150-1,500 animals. It has often been observed in association with Fraser's dolphins, and sometimes with spinner and spotted dolphins. Melon-headed whales have been reported to herd and perhaps attack small dolphins escaping from the tuna purse seine nets. They have a beak, an elongated short slim body, with long flippers and a tall, falcate dorsal fin. They are uniformly black in color, except for their belly, which is slightly lighter (Leatherwood and Reeves, 1983). Melon-headed whales in the ETP number approximately 45,400 animals, ranging from a low of 34,200 to a high of 110,300 (CV = 0.47) (Wade and Gerrodette, 1993). No melon-headed whales were reported killed in the ETP purse seine fishery in 1997, but mortality of this species has occurred in the 1986-97 period (IATTC Report,1998). They have no special status under the MMPA or the ESA.

3.2.2 Other Marine Mammals

Although there are other species of marine mammals, including some large whale species, that can be found in the ETP, there are few records of interaction between them and the tuna purse seine fishery (pers.comm). For this reason, the research is not expected to impact these species, and they are not discussed in detail in this document. For additional information about such species, see NMFS, 1999.

3.2.3 Sea Turtles

Turtles are rarely encircled in fishing operations and nearly all are released alive and in good condition. The IATTC 2000 reports indicate that during 1996-98, a combined total of 20,199 dolphin sets resulted in the death or injury of 45 sea turtles, or a rate of one per 449 sets. Since a maximum of 60 sets is expected during the proposed study, it is unlikely that any turtles will be harmed during this research. Turtle takes in the fishery are concentrated in certain areas and seasons, which may not overlap with the chase/recapture study area. Thus no negative effects on sea turtles are expected.

3.2.4 Tunas

The primary species of tuna involved in the ETP tuna purse seine fishery are the yellowfin (*Thunnus albacores*), skipjack (*Katsuwonus pelamis*), and bigeye (*Thunnus obesus*) tunas. The catches in sets that encircle dolphins are almost exclusively large, mature yellowfin tuna. The following four tuna species are caught to a lesser extent in the ETP fishery (and are not generally found in association with dolphins): bluefin (*Thunnus thynnus*), albacore (*Thunnus alalunga*), black skipjack (*Euthynnus lineatus*), and bonito (*Sarda chiliensis*). On rare occasions, billfish, large bony fish, sharks, and rays are encircled with tuna during dolphin sets. Tunas and other marine species encircled in the purse seine net during the chase-recapture experiment would be released except in cases where conditions make this infeasible. Because the experiment focuses on tracking and encircling dolphins, many of the sets performed may not involve tunas or other fish at all if the dolphin school is not associated with those other species at the time.

3.2.5 Seabirds

Seabirds are also sometimes found in association with schools of tuna and dolphin in the ETP and purse seine fisherman sometimes use sightings of seabird schools to direct them to schools of tunas and dolphins. During the chase and encirclement of the tuna and dolphin schools, seabirds disperse and are not directly affected by the actual research operations. The most common sea birds found in the ETP include a variety of shearwaters, boobies, terns, frigates, petrels, and jaegers. In fact, tuna fishermen (although not the NMFS researchers in this study) will often target aggregations of birds knowing that there may be schools of tuna below. Despite such close associations between sea birds and tuna, no sea birds have ever been observed caught in a purse seine net during tuna fishing operations in the ETP (T. Price (NMFS), personal communication, 1998) and none are expected to be impacted by this research.

4.0 Environmental Consequences

This section discusses the potential effects of the activities on the marine environment.

4.1 Effects of Alternative A - No Action/Deny Permit Request (Status Quo)

Denying the Permit would result in no direct consequences to the marine environment because no research program would be conducted. However, denying the research permit may have longer-term adverse effects on the environmental resources, specifically the dolphin stocks associated with the tuna purse seine fishery. As a result of the MMPA and international dolphin conservation efforts, changes in the fishery have greatly reduced the observed mortality of dolphins. However, there continues to be concern that intentional encirclement of dolphins is causing stress to the dolphins involved and that such stress may be having a significant adverse impact on population recovery. If the research does not occur, it will not be possible to determine if such "significant adverse impacts"are occurring or how they may be affecting the stocks. Any information that may result from this study would be vital for the Secretary of Commerce to make a determination about whether or not the tuna purse seine fishery in the ETP is having a significant adverse impact on any depleted dolphin stock.

4.2 Effects of Alternative B - Issue Permit for Proposed Action (Preferred Alternative)

The effects of repeated chase and encirclement on individuals in this study would be very small compared to the overall fishery effects on the dolphin stocks in the ETP. If a permit is issued for the research as proposed, temporary or permanent adverse impacts (e.g., serious injury or accidental mortality) on individual dolphins in this study could occur from aspects of fishing operations (chase and encirclement, helicopter overflight, confinement in the purse seine net, and release via backdown procedure) and from aspects of the scientific sampling (handling, sampling, examination, tagging). This research specifically seeks to evaluate the affects of fishery operations on the dolphin stocks of the ETP. No additional adverse effects on the population or stock level above those caused by the fishery are expected to occur from the experiment, because the set operations constitute only a small fraction of the total number of sets each year, and because the chartered fishing vessel would be engaged in regular fishing activities

involving a similar number of sets on dolphins in the absence of the research project. The frequency of repeated capture of the IDCPA proposed experiment will be similar to the capture rate observed in the fishery, and the 30-60 sets requested for this study represent only 0.3 to 0.6% of the fishery total of about 10,000 sets per year (IATTC 2000). The maximum number of dolphins to be chased and encircled (24,000 including repeat captures) represents about 1.5% of the total population of the two main target species (eastern spinner and northeastern offshore spotted dolphins), and the maximum number of dolphins to be handled and sampled one or more times (540) represents 0.34%. The requested authorization of up to 40 accidental deaths during the course of purse seine operations would remove 0.002% of the individuals in these two populations. These levels are considered insignificant to the dolphin stocks. Any accidental dolphin mortality will be part of the IATTC Director's Reserve under the annual Dolphin Mortality Limits (DMLs) set for the fishery, and will therefore not increase the total allowable takes on these stocks.

During confinement in purse-seine nets, dolphins' behavior and stress responses range from agitation displays and hyperactvity to passive behaviors such as sleeping, sinking, and rafting (Norris et al., 1978; Coe & Stuntz, 1980; and Pryor & Shallenberger, 1991). During studies in 1992-93 of tuna-dolphin associations, 3 dolphins died as a result of a gear malfunction in one out of 23 project sets, (M. Scott, pers. comm). The proposed research technique will mimic that of normal fishing operations, and the resulting impacts would likely be the same as those that would occur during normal tuna fishing operations. The potential consequences to dolphins, particularly spinner and spotted dolphins, of chase and capture in the normal ETP tuna purse seine fishery also includes negative psychological or social impacts, including social separation and aggression, which may then result in physiological responses (Fair & Becker, 2000). However, it is not known if these responses are adaptive or if they cause adverse impacts on the health and survival of individual dolphins in the ETP (Fair & Becker, 2000).

In a study in Florida in which individual dolphins are captured, sampled, tagged and released, some animals have been captured repeatedly since 1970 with no long-term impacts observed. Indeed, long-term home range stability and predictable social bonds were two of the strongest structural features noted (Wells, 1986; Wells, Scott and Irvine, 1987; Scott, Wells and Irvine, 1990; Wells, 1991; Wells, et al, 1999). Dolphins captured and tagged in waters near Sarasota during 1970-1971 have been observed in the same area through 1999. Wells (SRP app 2000) noted that increases in dolphin use of the study area, increased birth rates, and increased survivorship provide additional confirmation of the lack of adverse longer-term effects. No dolphin deaths have been caused by the capture, sampling and handling of Florida bottlenose dolphins. During studies in 1992-93 of ETP tuna-dolphin associations, one spotted dolphin exhibited 'breath-holding' behavior, which may be indicative of capture stress, and was immediately released alive (M. Scott, IATTC, pers. comm.).

Apart from direct harassment that occurs during the purse seine fishing operations that will be employed, potential level B Harassment by approach may occur incidental to dolphin school sighting operations that may be conducted from the research vessel. Reactions from boat approach range from a positive response, e.g., bowriding in *Tursiops*, to strong avoidance

behavior by *Stenella* to no reaction at all by both species (Wursig, et al, 1998). Only minor temporary effects are expected as a result of this harassment.

This research seeks to evaluate exactly the effects of fishery operations on the dolphin stocks of the ETP. However, no additional adverse effects on the population or stock level are expected to occur from the experiment, because the set operations constitute only a small fraction of the total number of sets each year (IATTC 2000). The maximum number of dolphins to be chased, encircled, and sampled one or more times (24,000) represents about 1.5% of the total population of the two main target species (eastern spinner and northeastern offshore spotted dolphins). The requested authorization of up to 40 accidental deaths during the course of purse seine operations would remove 0.002% of the individuals in these two populations, and considered insignificant to the dolphin stocks. This dolphin mortality will be part of the IATTC Director's Reserve under the annual Dolphin Mortality Limits (DMLs) set for the fishery. It will replace any mortality that the fishing vessel would have caused if it had been engaged in normal fishing operations.

Whenever possible, a high priority will be placed on tagging and recapturing females, because stress-related effects on reproduction (miscarriage, damage to foetus, separation from calves) are one major way that individual stress could translate into population-level effects. Any calves associated with a particular handled female will be allowed to remain as close as possible to the mother during tagging or released to join the group of dolphins not sampled. Calves that are retained with the female will have a skin sample collected (see SPR application for sampling methodology). Spotted dolphin mother/calf pairs encircled during fishing operations were observed to reform and remain together even after brief separations, suggesting that permanent separations within the net are probably uncommon (Archer, et al., in press). While it is difficult to assess the fraction of permanent separation outside the net, it is expected that mothers and calves would find one another after brief periods of separation (Archer, et al., in press). The applicants only expect to hold females and calves a maximum of 10 minutes, and if there are indications of danger to the calf, both will be released as quickly as is safely possible.

While changes in the fishery have greatly reduced the observed mortality of dolphins, there continues to be concern that the fishing methods used are causing stress to the dolphins involved and that such stress may be having a significant adverse impact on population recovery. As a result, the IDCPA requires that research consisting of population abundance surveys and "stress studies" be conducted by the NMFS to determine whether the "intentional deployment on, or encirclement of, dolphins by purse-seine nets is having a significant adverse impact on any depleted dolphin stock".

The goal of the chase/recapture experiment is to provide sound scientific data on physiological indicators of stress in chased and captured dolphins, and, if possible, to estimate a range of consequences for the individual dolphin's survival and reproduction. While the possibility of adverse effects to individual animals exists from chase/recapture experiments, issuance of a permit to conduct the stress studies of repeated chase and recapture as outlined in the IDCPA is not likely to result in significant cumulative effects at a population level because less than 2% of the population are likely to be affected. Population-level conclusions about the potential for significant adverse impacts of fishery-induced stress will be based on the complete results of all

studies mandated in the IDCPA, including the chase/recapture experiment, and also population abundance surveys (Gerrodette 1999, 2000), a review of relevant stress-related research (Curry 1999), necropsy samples from dolphins killed in the commercial fishery, and a review of historical demographic and biological data from the affected dolphin stocks. The combined results from all five research components will be included in a final report to Congress evaluating potential significant adverse effects of the fishery on the depleted dolphin stocks.

NMFS does not anticipate any future actions under the IDCPA scientific research program that would have cumulative effects on the environment or resources described herein.

4.3 Effects of Alternative C - Issue Permit using an Alternative Test Method

Potential effects of this Alternative would be similar to those of Alternative B, except that there would not be a possibility of an increased number of sets on dolphins because the research would be conducted during the course of regular fishing operations. Dolphins would not be subjected to repeated chase/capture/recapture, tagging, and other sampling which would, theorically, decrease the level of impact to some individuals. However, because fewer, less experienced personnel will be available to conduct the dolphin sampling operations and monitor net conditions, and because actual fishing operations take place in poorer weather conditions, the sampling itself could cause additional risks to individual dolphins, compared to Alternative B.

This alternative would not allow for the collection of a representative sample from the stock of dolphins, but would rather target only animals exhibiting presumed signs of stress or adverse effects (see Alternative C). Blood samples would be collected in a manner similar to that described for the proposed action; however, the number of samples that could safely be obtained in each set would be reduced in this case because: 1) fewer personnel would be dedicated to the task; 2) the net would not be held open for dolphin sampling during regular fishing operations; and 3) sets would be made during poorer weather conditions. With only two to four people available for the task, blood samples could realistically only be obtained from a single dolphin per set, and only when weather and net conditions are favorable. With the average fishing trip lasting about 50 days and including 27 sets (IATTC 2000), and poor weather conditions preventing safe sampling about 30% of the time, this would provide samples from about only 20 dolphins per trip. To obtain a sample size comparable to that likely to be obtained by the proposed action Alternative B (about 180-300 dolphins sampled at least once), comparable to that of the proposed action alternative (B), about 9-15 fishing trips would have to be covered, taking approximately six to ten months, assuming three simultaneous teams are deployed. Dolphins would not be tagged or tracked during this alternative; therefore, there would be no way to ensure or document repeated sampling of individual dolphins. This would be inconsistent with the mandates of the IDCPA, which requires an experiment involving the repeated chasing and encircling of individual dolphins to simulate actual conditions of the ETP tuna purse seine fishery and would not be as effective at determining the impacts of the fishery's activities on dolphin populations. Furthermore, the lack of information on the recent capture history of sampled dolphins would make interpretation of the blood samples difficult or impossible.

The teams placed aboard the tuna vessel would require extensive prior laboratory experience processing blood samples (to prevent contamination or damage to the samples) and experience handling and drawing blood from wild dolphins according to veterinary protocols (to minimize risk to the dolphins). Specialized equipment (centrifuge, electronic analyzer, -80°C freezer, liquid nitrogen) would have to be loaded and installed aboard the fishing vessel, and a climate-controlled lab space would have to be designated aboard the tuna vessel for processing. Due to already limited space, it is unlikely that one or more commercial fishing vessels would have the ability and/or be willing to house all of the necessary equipment. If only minimal equipment and lab space are available, as is likely on commercial fishing vessels, some of the important blood analyses that are planned in the proposed action alternative (B) would not be possible (e.g. immunological studies) because of the stringent processing and storage requirements.

5.0 Mitigation Measures

If a permit is issued for Alternative B, it will contain mitigation measures to minimize adverse impacts to the species involved. Those mitigation measures will include:

- Keeping handling time to a minimum (about 10 minutes) during capture and sampling operations, and releasing dolphins as quickly as possible if they show signs of handling stress.

- Whenever possible, capturing only the subset of the dolphin school containing the target animals (those previously tagged), to minimize unnecessary disturbance of non-target animals.

- Retaining calves for a maximum of 10 minutes and prohibiting collection of skin samples from calves using invasive techniques (samples from calves would only be collected using a scrubber or other topical non-invasive technique).

- Calves will be allowed to remain close to the mother if the mother is handled, but if there are indications of danger to the calf, both will be released as quickly as is safely possible.

- Sampling operations will be terminated when required to ensure safety of personnel and dolphins and proper functioning of the backdown procedure.

- If turtles are encircled during the chase/recapture experiment, a) they will be released unharmed from the net as soon as possible, and b) if turtles are encircled, set operations must be moved to an new area to prevent accidental deaths or injuries.

6.0 Consultation

Information provided by the NMFS, Southwest Fisheries Science Center, submitted by the applicant in the application, and from other individuals was utilized in the preparation of this draft EA.

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8.0 Finding of No Significant Impact